



Paper Accepted*

ISSN Online 2406-0895

Preliminary Report / Претходно саопштење

Vuk Sekulić^{1,2}, Jovo Bogdanović^{1,2,†}, Jasenko Đozić^{1,2},
Ranko Herin¹, Dimitrije Jeremić^{1,2}

Modified orthotopic ileal neobladder – surgical technique and initial results

Модификована ортотопска илеална необешика – хируршка техника и почетни резултати

¹ Clinic of Urology, Clinical Center of Vojvodina, Novi Sad, Serbia;

² Faculty of Medicine, University of Novi Sad, Novi Sad, Serbia

Received: April 7, 2017

Accepted: July 21, 2017

Online First: August 1, 2017

DOI: <https://doi.org/10.2298/SARH170407152S>

* **Accepted papers** are articles in press that have gone through due peer review process and have been accepted for publication by the Editorial Board of the *Serbian Archives of Medicine*. They have not yet been copy edited and/or formatted in the publication house style, and the text may be changed before the final publication.

Although accepted papers do not yet have all the accompanying bibliographic details available, they can already be cited using the year of online publication and the DOI, as follows: the author's last name and initial of the first name, article title, journal title, online first publication month and year, and the DOI; e.g.: Petrović P, Jovanović J. The title of the article. *Srp Arh Celok Lek*. Online First, February 2017.

When the final article is assigned to volumes/issues of the journal, the Article in Press version will be removed and the final version will appear in the associated published volumes/issues of the journal. The date the article was made available online first will be carried over.

† **Correspondence to:**

Jovo BOGDANOVIĆ

1-3 Hajduk Veljkova Street, 21000 Novi Sad, Serbia

E-mail: jovo.bogdanovic@mf.uns.ac.rs

Modified orthotopic ileal neobladder – surgical technique and initial results

Модификована ортотопска илеална необешика – хируршка техника и почетни резултати

SUMMARY

Introduction/Objective *Vesica ileale Padovana* is the surgical technique for reconstruction of lower urinary tract following radical cystectomy using isolated ileal segment. This operative technique requires dissection of both ureters in full length, that can't be possible in some cases.

The paper is aimed to present our experience with modified surgical technique of *vesica ileale Padovana* using 40 cm of an isolated ileal segment and initial results.

Methods 10 male patients received modified ileal neobladder following radical cystectomy at our institution during the period 2008 to 2011. The mean age of patients was 59 years (45–70). Median follow-up was 76 months (62–93). Patients were monitored cautiously for functional outcome, local recurrence, and distant progression.

Results Perioperative, early and late postoperative mortality have not been noticed. There were only 2 major complications: prolonged postoperative ileus and prolonged urinary leakage requiring percutaneous nephrostomy and subsequent ureteral reimplantation due to stenosis of ureterovesical anastomosis in 1 patient (10 %), respectively. Average ileal neobladder capacity was 450 ml. Daytime and night continence were achieved in 9 (90%) and 7 (70%) of patients, respectively.

Conclusion This modification of orthotopic ileal neobladder has not been difficult to perform in our hands. Modified technique provides a clear advantage in easier ureteral implantation more proximally than in the original technique, requiring less length of ureters. Initial encouraging results should be confirmed in further clinical practice.

Keywords: urinary bladder neoplasms; cystectomy; urinary diversion; reconstructive surgery

САЖЕТАК

Увод/Циљ *Vesica ileale Padovana* је један од начина реконструкције доњег уринарног тракта после радикалне цистектомије коришћењем изолованог сегмента илеума. Оперативна техника захтева препарацију оба уретера читавом дужином, што није могуће код свих болесника.

Циљ рада је да се прикажу наша модификација оперативне технике *Vesica ileale Padovana* употребом изолованог сегмента илеума дужине 40 cm и иницијални резултати њене примене.

Метод У периоду од 2008–2011. код 10 болесника је урађена радикална цистектомија са деривацијом урина модификованом техником *Vesica ileale Padovana*. Просечна старост болесника била је 59 година (45–70). Просечно време праћења било је 76 месеци (62–93), а посматрани су функционални и онколошки резултати.

Резултати Периоперативни, рани и касни постоперативни морталитет нису забележени. Биле су само две компликације: протраховани динамски илеус код једног болесника и цурење урина на уретеронеобешичној анастомози која је захтевала перкутану нефростому са накнадном реимплантацијом уретера због стенозе, код једног болесника. Просечан капацитет необешике био је 450 ml. Дневна и ноћна континенција су постигнуте код 9 (90%), тј. 7 (70%) болесника.

Закључак Модификовану технику илеумске необешике није тешко извести, а пружа значајну предност због једноставније анастомозе уретера и необешике која се налази нешто проксималније у односу на оригиналну технику. Охрабрујући иницијални резултати треба даље да се потврде у клиничкој пракси.

Кључне речи: неоплазме мокраћне бешике; цистектомија; деривације урина; реконструктивна хирургија

INTRODUCTION

Radical cystectomy with urinary diversion is the gold standard in the treatment of patients having non-metastatic muscle invasive bladder cancer (T2-4a, N0-x, M0). Radical cystectomy is also indicated in patients with recurrent, BCG-refractory, high-risk superficial tumors as well as those with primary unresectable superficial tumors [1]. Urinary diversions can be classified as heterotopic and orthotopic. In heterotopic urinary diversions, urine is derived through urostomy that can be incontinent such as ureterocutaneostomy and ileal conduit or continent like Indiana pouch and Kock pouch. In orthotopic urinary diversions, urine is derived through the urethra. A plentitude of

orthotopic bladder substitutes following radical cystectomy has been reported in the literature previously [2, 3]. These procedures are attractive for patients requiring radical cystectomy because an avoidance of abdominal urostomy improves patient's satisfaction with preserved body image.

Surgical technique of *vesica ileale Padovana* was originally reported by Pagano et al. [4]

This technique is created to imitate a natural bladder with implantation of the ureter in an antireflux manner. However, this technique requires careful preparation of ureters in full length because an insufficient length of ureters can pose a real obstacle to the accomplishment of this procedure. Our modification of ileal folding after funnel creation enables more proximal implantation of ureters into the neobladder.

This paper is aimed to present our modification of this surgical technique as well as initial results.

METHODS

During the period from January 2001 to November 2016, 420 patients underwent radical cystectomy at our institution. Out of them, 135 patients have received ileal orthotopic bladder substitution.

During the period 2008 to 2011, 10 male patients with muscle invasive bladder cancer or BCG-refractory, T1G3 recurrent bladder cancer underwent radical cystectomy with modified vesica ileale Padovana orthotopic bladder replacement. Patients have been selected for this procedure using further criteria: (1) preoperative pathological stage \leq pT2b, (2) absence of tumor in the prostatic urethra, (3) preserved morphology of upper urinary tract, (4) ASA score \leq 3, and (5) no preoperative chemotherapy nor radiotherapy.

Surgical Technique

After pelvic lymphadenectomy and cystectomy with prostatectomy, the procedure is continued with reconstructive surgery. A total of the 40-cm segment of ileum is isolated and detubularized (Figure 1) to create the orthotopic reservoir. Continuity of intestinal tract is re-established with two-layer end-to-end ileal anastomosis. Only 10 cm of the distal end of the isolated ileum is used for the creation of the funnel for anastomosis with the urethra (Figure 2). The funnel is sewn by 2 running polyglactin 3-0 sutures as described in the original technique [4].

Further steps represent a modification of original technique. The rest of isolated ileal segment is folded in form of letter M (Figure 3). Lateral arms of M letter serve for the creation of an extraluminal serosa-lined tunnel for insertion of the ipsilateral ureter (Figure 4). The left ureter has to be pulled carefully through the mesentery of the neobladder, taking a care to avoid injury to mesenteric vessels. Both ureters are spatulated on the anterior side in length 12 to 15 mm and sutured in the lateral serosal tunnel by six to eight interrupted polyglactin 3-0 stitches. Both ureteral anastomoses are protected by ureteral catheter 6 to 8 Fr. Migration of ureteral catheters is prevented by fixation to the

ureteral wall with rapidly absorbable 4-0 polyglactin suture taking care not to damage ureteral blood supply. Following anastomosis of the ureter with neobladder, the serosal tunnel is closed over ureter using polyglactin 3-0 running suture (Figure 4).

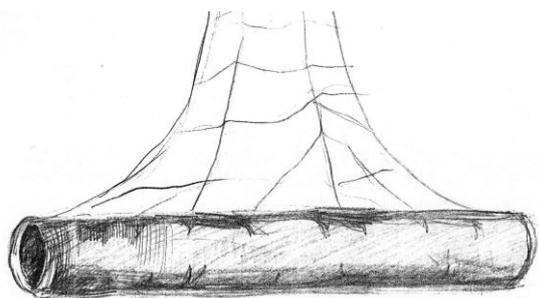


Figure 1. Detubularized isolated ileal segment in the full length.

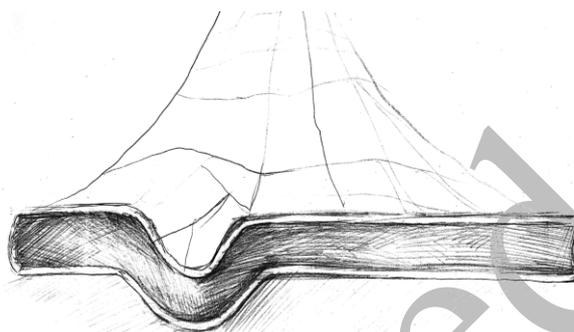


Figure 2. Preparation for the creation of funnel outlet.

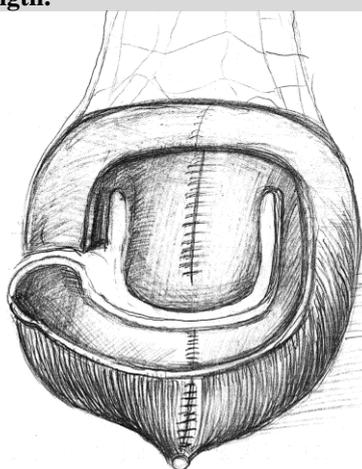


Figure 3. Creation of the "M" plane.

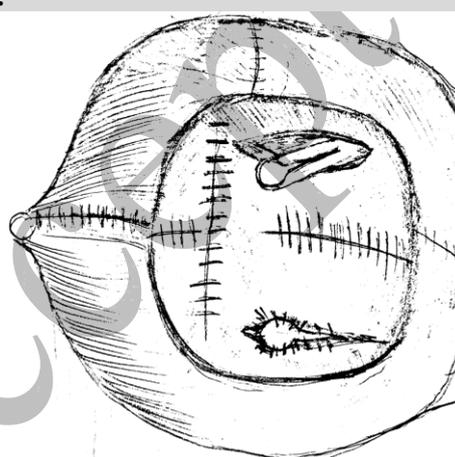


Figure 4. The posterior wall is created with serous-lined extramural tunnels and both ureters are indwelled into the neobladder. In the further step, ureters have to be spatulated on the anterior side, splinted and anastomosed to the neobladder. Thereafter, serous-lined tunnels are closed over the ureters.

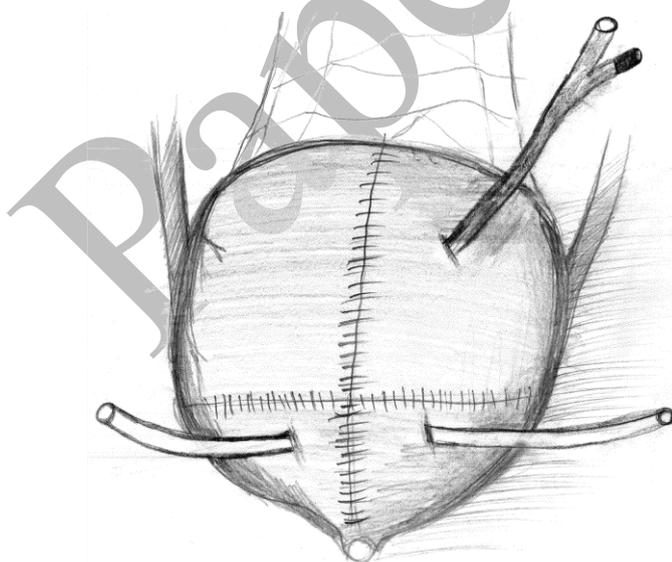


Figure 5. Final aspect of the neobladder following the closure of the anterior wall with cystostomy catheter and ureteral splints.

Finally, "M" plane is folded anteriorly to create an anterior wall of neobladder and sutured to the anterior side of previously formed funnel using seromuscular running suture with polyglactin 3-0 (Figure 5). Before completion of reservoir closure, ureteral catheters are passed through the anterior wall of neobladder. Also, 12 Fr two-way Foley catheter is placed for suprapubic cystostomy. Neobladder-urethral anastomosis is created with 6 interrupted polyglactin stitches over 18 Fr three channel Foley catheter.

Follow-up

All patients were followed every 3 months during the first year, thereafter every four months during the second year, twice per year until the fifth year, and thereafter once per year. Upper urinary tract status was assessed using IVP or CT urography 6 months and two years after surgery. Routine laboratory analyses including sedimentation rate, WBC, RBC, BUN, creatinine, liver function tests and urine were performed to each patient on every visit. Also, ultrasound of upper abdomen and chest X-ray were performed to all patients on every visit. Uroflowmetry was performed at 6 months visit and urodynamic study at 12 months after the surgery. Daytime and nighttime continence were assessed by interview of each patient during check-up visits.

RESULTS

Seven males with muscle invasive bladder cancer and 3 males with recurrent BCG-refractory T1G3 bladder cancer underwent radical cystectomy and orthotopic ileal neobladder using described modified technique. Patients were aged 59 years in average, ranging 45-70. Bladder confined disease (< pT3a) without lymph node metastases (pN0) was confirmed in all patients by pathological examination of the surgical specimen. There was no perioperative, early or late postoperative mortality.

There were only 2 major complications: prolonged postoperative ileus and prolonged urinary leakage requiring percutaneous nephrostomy and subsequent ureteral reimplantation due to stenosis of ureteroneovesical anastomosis in 1 patient, respectively. There were no significant metabolic disorders.

Uroflowmetry at the 6 months has shown Q max 20.3 ml/sec in average, ranging from 10 to 31 ml/sec. Observed curves have not been interrupted, although were more or less undulated. Postvoiding residual urine was 13 ml in average, ranging from 0 to 90 ml. The mean capacity of neobladder is 450 ml, ranging from 350 to 600 ml. All patients had satisfying bladder compliance and no one patient had spontaneous neobladder contractions or pressure over 15 cm H₂O during the filling phase.

Daytime and nighttime continence were achieved in 9 (90%) and 7 (70%) of patients, respectively.

DISCUSSION

Orthotopic bladder substitution is probably the most complex reconstructive procedure in urooncological surgery. The original technique of *Vesica ileale Padovana* was described in 1990 [4]. This neobladder seems to be the most resembling the natural bladder. Unfortunately, the technique has not become widely popular among the urologists due to several reasons. First, a preparation of full length of both ureters is required to perform their implantation correctly. Second, some authors have

reported that funnel shaped neobladders were disposed to emptying difficulties [5]. Finally, a creation of *Vesica ileale Padovana* seems to be complicated for the majority of urologists.

On the other hand, widely accepted neobladders, such as Studer or Hautmann, require approximately 60 cm of ileum for the creation of the reservoir. Aleksić et al found that higher capacity neobladders were associated with a higher postvoiding residual volume as well as higher reabsorption of urine [6]. Also, these orthotopic bladder substitutes are associated with a higher probability of malabsorption syndrome due to the usage of the longer segment of terminal ileum.

Vesica ileale Padovana is a spheroidal reservoir that ensures optimal volume to surface ratio. Also, this type of neobladder provides low end-filling pressure. Implantation of ureters using serous-lined extramural tunnel technique originally described by Abol-Enein provides excellent antireflux mechanism [7]. However, sometimes ureters do not have sufficient length for the creation of tension free uretero-neobladder anastomosis. Therefore, we suggest this modification, using different ileal folding to achieve serous-lined extramural tunnel more proximally than in original technique. This modification also enables the creation of shorter funnel-shaped outlet of the neobladder, diminishing long-term problems with bladder emptying.

Average neobladder capacity in the study was 450 ml at 12 months after surgery. Yadav et al reported an increase of the neobladder capacity up to 3 years after surgery. They created modified ileal neobladder using 45 centimeters of ileum and reported bladder capacity of 410 ml, 502 ml, and 588 ml at 1, 2 and 3 years after surgery, respectively [8].

Average Q max was 20.3 ml/s with a range from 10 to 31 ml/s. The vast majority of studies have similar flow rates. However, the neobladder does not have significant contractions. Urinary flow rate depends on driving force (straining of abdominal muscles or Crede's maneuver) as well as relaxation of urethral sphincter. Therefore, patients with neobladder usually have undulated shapes on the uroflowmetric curve.

One patient with advanced age in the study has lost daytime continence three years after surgery probably due to decreased tonus of urethral sphincter. The nighttime leakage of urine was persistent during the follow-up period in 3 (30%) patients. However, an expert panel at consensus conference convened by the World Health Organization (WHO) and the Société Internationale d'Urologie (SIU), has found 20-30% prevalence of nighttime incontinence in the most of the reported series [9]. Detubularization of the isolated ileal segment is key maneuver leading to the low-pressure reservoir. All neobladders have a good compliance due to characteristics of the bowel, and pressures over 15 cmH₂O have not been recorded during the filling phase of cystometry.

CONCLUSIONS

This modification of VIP neobladder has not been difficult to perform in our hands. In our opinion this technique provides a clear advantage in easier ureteral implantation more proximally than

in original technique, requiring less length of the ureter. Initial encouraging results should be confirmed in further clinical practice.

ACKNOWLEDGEMENTS

The authors are thankful to Mr Vidoje Tucović for his technical assistance with drawings as well as Mr Igor Baić for his help to improve the writing style of the manuscript.

REFERENCES

1. Witjes AJ, Lebet T, Compérat EM, Cowan NC, De Santis M, Bruins HM, et al. Updated 2016 EAU Guidelines on Muscle-invasive and Metastatic Bladder Cancer. *Eur Urol.* 2017; 71: 462–75.
2. Hautmann RE, Abol-Enein H, Lee CT, Mansson W, Mills RD, Penson DF, et al. Urinary diversion: how experts divert. *Urology.* 2015 ; 85: 233–8.
3. Nagele U, Sievert KD, Merseburger AS, Anastasiadis AG, Stenzl A. Urinary diversion following cystectomy. *European Association of Urology Update Series* 3. 2005; 129–37.
4. Pagano F, Artibani W, Ligato P, Piazza R, Garbeglio A, Passerini G. Vescica Ileale Padovana: a technique for total bladder replacement. *Eur Urol.* 1990; 17: 149–54.
5. Studer UE, Burkhard FC, Schumacher M, Kessler TM, Thoeny H, Fleischmann A, et al. Twenty years experience with an ileal orthotopic low pressure bladder substitute – lessons to be learned. *J Urol.* 2006; 176: 161–6.
6. Aleksic P, Bancevic V, Milovic N, Kosevic B, Stamenkovic DM, Karanikolas M, et al. Short ileal segment for orthotopic neobladder: a feasibility study. *Int J Urol.* 2010; 17: 768–73.
7. Abol-Enein H, Ghoneim MA. Functional results of orthotopic ileal neobladder with serous-lined extramural ureteral reimplantation: experience with 450 patients. *J Urol.* 2001; 165: 1427–32.
8. Yadav SS, Gangkak G, Mathur R, Yadav RG, Tomar V. Long-term Functional, Urodynamic, and Metabolic Outcome of a Modified Orthotopic Neobladder Created With a Short Ileal Segment: Our 5-year Experience. *Urology.* 2016; 94: 167–72.
9. World Health Organization (WHO) Consensus Conference on Bladder Cancer, Hautmann RE, Abol-Enein H, Hafez K, Haro I, Mansson W, Mills RD, et al. Urinary Diversion. *Urology.* 2007; 69, (Suppl 1): 17–49.